ADVANCES IN MATERIALS ENGINEERING

Volume 1

Edited By:
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Table of Content

Chapter 034

Workability of Coir Fibre- Reinforced Cement-Albumen Composite

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Abstract. The randomly distributed short coir fibre reinforced cement based composite using egg albumen as the matrix material is among the new development of lightened concretes. This paper reported on the effect of coir fibre content on the workability performance of the cement-albumen composite. The workability is a crucial factor to ensure that the cement composite can be filled completely in the formwork while maintaining its quality during transportation and placement and it was tested via slump test. The volume fraction of fibre varies between 0, 1, 2, 3, 4, 5 and 6 wt. % while egg albumen maintains its optimum volume fraction at 65 wt. %. The mixture is made based on composite 'Rule of Mixture'. The workability property of the cement composite using water as the hardening agent is also investigated and worked as control specimen. The results show that adding fiber to the lightweight concrete mixture greatly reduces the sedimentation of aggregates during mixing and improves the uniformity of the mix; however, the slump value is reduced.

Introduction

Creation of environmental-friendly and higher performance type cement composite is considered in order to replace the existing ordinary concrete which is heavy, brittle with high water absorption rate. Due to ecological concerns, investigation on the use of natural fibre as reinforcing material has shown encouraging results [1]. Simultaneously, they are abundantly available at low cost, less abrasive and harmful to mankind and yielded lightweight product.

Coir or coconut fibre has the potential as a reinforcing material in the production of cement construction components [2-5]. It is a cheap [1-2], strong fibre which is not as brittle as glass fibre and durable [1,3], amenable to chemical modification, non-toxic, possesses no waste disposal problem [6], and exhibits useful mechanical properties. Research reported that composite made with short coir fibres and ordinary Portland cement matrix presented a significant increase in toughness [2].

In addition, egg albumen is a biopolymer which offers an interesting alternative for synthetic polymer due to its non-toxicity, harmlessness, and reliability in processing [7]. It is believed that the protein network plays an important role in providing mechanical properties for the encapsulating matrix [7]. However, little research is done on protein matrix.

Workability is a crucial factor that may affect the application and physico-mechanical properties of fibre reinforced concrete (FRC). Workability refers to the relative ease or difficulty of placing and consolidating fresh concrete. Too much stiffness concrete mixture, however, makes it too difficult to work the concrete into the forms. On the other hand, too fluid mixture is also detrimental. A favourable workability in fresh concrete is essential in ensuring the reinforcement can be filled completely, accordingly and maintained its quality during mixing, transportation, placement and compacting [8-9]. Moreover, investigation of FRC at its fresh state is vital to avoid